Advanced Combat Helmet Generation II (ACH Gen II) Source Selection Sample Testing and Examination

1. Requirements and Verification. The source selection samples shall be tested according to the ACH Gen II Purchase Description (PD) AR/PD 14-01, with exceptions as described in Section 3. Testing outlined in Sections 2 and 3 shall be conducted at a National Institute of Justice (NIJ) accredited laboratory. Visual examination described in Section 4 shall be conducted by the Source Selection Evaluation Board (SSEB).

2. Required Tests. All tests outlined in Table I shall be accomplished for each submitted helmet design. A total of 94 helmets are required for source selection sample testing, as outlined in Table I. Additional contingency helmets may be required to complete the tests. Tests shall be conducted in accordance with appropriate Requirements and Verifications section/subsection as well as Appendix A of AR/PD 14-01.

Table I. Source Selection Samples

Test	Minimum Samples Required
Fragmentation Protection (V50)	14 Total (3 S, 4 M, 3 L, 4 XL)
Resistance to Penetration (RTP)	48 Total (12 of each size (S, M, L, XL))
Ballistic Transient Deformation (BTD)	
Weight	All tested samples
Shell Thickness & Uniformity	4 Total (1 of each size (S, M, L, XL))
Compression Resistance (Top to Bottom)	4 Total (1 of each size (S, M, L, XL))
Compression Resistance (Side to Side)	4 Total (1 of each size (S, M, L, XL))
Impact Resistance	4 Total (1 of each size (S, M, L, XL))
Flame Resistance	4 Total (1 of each size (S, M, L, XL))
Blunt Impact Protection	12 Total (3 of each size (S, M, L, XL))

3. Exceptions or Differences for Source Selection Sample Testing. The following paragraphs describe any exceptions or difference between the Source Selection Sample Testing requirements and verification, and the requirements and verifications as described in AR/PD 14-01.

3.1. V50. Table II shows the ballistic resistance (V50) tests required for Source Selection Sample testing. Each of these must be completed in accordance with the guidance in AR/PD 14-01.

Table II. Fragmentation Protection (V50) Test Matrix

	Ambient	Hot	Cold	Seawater
2-Grain RCC *4200 FPS min*	1 V_{50} Size S		1 V_{50} Size L	
4-Grain RCC *3475 FPS min*		1 V_{50} Size S	1 V_{50} Size M	
16-Grain RCC *2475 FPS min*	1 V_{50} Size L	1 V_{50} Size XL		
17-Grain FSP *2200 FPS min*	1 V_{50} Size M	1 V_{50} Size L	1 V_{50} Size XL	1 V_{50} Size S
64-Grain RCC *1750 FPS min*		1 V_{50} Size XL	1 V_{50} Size M	

3.2. RTP. A total of 48 helmets must be examined against the RTP requirement as delineated in AR/PD 14-01 paragraph 3.7.2. The sequence and shot locations for this requirement are shown in Table III. This RTP shot sequence will be segregated into a Part A and Part B. Part A is the 22 shots highlighted in blue and marked with an asterisk. Part B is the remaining 74 shots shown. Parts A and B together consist of 96 total shots.

Table III. The 9mm RTP Shot Sequence

Size	Sample Number	Ambient		Hot		Cold		Seawater	
		Shot 1	*Shot 2*	*Shot 1*	*Shot 2*	*Shot 1*	*Shot 2*	*Shot 1*	*Shot 2*
Small	1	C*	B*	L	F	C*	B*	L	F
	2	L*	F*	C	B	R	F	C	B
	3	C	B	R	F	C	B	R	F
Medium	4	R	F	C*	B*	R	F	C	B
	5	C	B	R*	F*	C	B	L	F
	6	L	F	C	B	L	F	C	B
Large	7	C	B	R	F	C*	B*	R	F
	8	R	F	C	B	L*	F*	C	B
	9	C	B	L	F	C	B	L	F
Extra-Large	10	L	F	C*	B*	L	F	C*	B*
	11	C	B	L	F	C	B	R*	F*
	12	R	F	C	B	R	F	C	B

Note: C = Crown, R = Right, L = Left, F = Front, B = Back

Other than the differences noted in shot sequence and number of shots, all Source Selection Sample RTP testing conducted must follow the verification procedure given in AR/PD 14-01. Conformance criteria are listed in Table IV.

Table IV. RTP Conformance Criteria

Clopper-Pearson Lower Confidence Level (LCL)				Complete Penetrations	
	Minimum Conforming Population (%)	Confidence Level (%)	Total Observations	Acceptable	Unacceptable
Aggregate	94	90	96	≤ 2	≥ 3
Size	84	90	24	≤ 1	≥ 2
Location	84	90	24	≤ 1	≥ 2
Environment	84	90	24	≤ 1	≥ 2
Size by Location	48	90	6	≤ 1	≥ 2
Size by Environment	48	90	6	≤ 1	≥ 2
Location by Environment	48	90	6	≤ 1	≥ 2

3.3. BTD. For each RTP shot, BTD shall be measured and reported for Government reference. BTD shall be measured in accordance with AR/PD 14-01. No Upper Tolerance Limit calculations regarding BTD are required.

3.4. Weight. All helmets used for Source Selection Sample testing shall be weighed and results reported. In tests where finished helmets are required, the weighed finished helmets shall be as described in AR/PD 14-01 Section 3.2.c, which includes the finished shell plus all suspension system attachment material (i.e., hook disks or hook tape), any NVG bracket integration components (not including the bracket itself or the bracket bolt), a complete suspension system, and a complete retention system including any attaching hardware, assembled in the standard configuration. All Source Selection Sample testing results without accompanying helmet weights will be considered invalid. Unused contingency samples do not need to be weighed. The finished helmets shall be weighed on a scale accurate to 0.001 lb or better. If necessary, weights shall be rounded to the nearest 0.001 lb in accordance with the rounding method of ASTM E29 *Using Significant Digits in Test Data to Determine Conformance with Specifications*.

3.5. Shell Thickness and Uniformity. No changes or exceptions.

3.6. Compression (Top to Bottom). No changes or exceptions.

3.7. Compression (Side to Side). No changes or exceptions.

3.8. Flame Resistance. Testing for Flame Resistance shall be conducted on one (1) finished helmet of each size (S, M, L, XL). Results will be averaged in accordance with the procedure given in procedure given in AR/PD 14-01.

3.9. Blunt Impact Protection. Three (3) finished helmets of each size (S, M, L, XL) shall be tested: one (1) each for testing in each of the three (3) environmental conditions (Ambient, Hot, Cold). During Source Selection Sample Testing, Helmet Position Index (HPI) shall be

determined by the vendor without verification by ATC. The helmet shall be in the "as-worn" position. HPI shall be reported in the test report. During FAT and LAT, HPI shall be determined by the vendor and verified by ATC as described in AR/PD 14-01.

3.9.1. Blunt Impact Protection Lower Confidence Level. Blunt impact testing shall meet a 90% probability of accelerations not exceeding 150g (where g is the constant rate of acceleration due to earth's gravity at sea level) with a 90% Lower Confidence Level, calculated by combining the first and second impacts (aggregate). Testing shall also meet a 79% probability of accelerations not exceeding 150g with a 90% Lower Confidence Level for each size, each location, and each environment. Table V shows the evaluation criteria for Source Selection Sample testing blunt impact protection.

Table V. Blunt Impact Protection Conformance Criteria

Clopper-Pearson Lower Confidence Level				**Values Above 150g**	
	Minimum Conforming Population (%)	Confidence Level (%)	Total Observations	Acceptable	Unacceptable
Aggregate	90	90	168	≤ 11	≥ 12
Size	79	90	42	≤ 5	≥ 6
Location	79	90	24	≤ 2	≥ 3
Environment	79	90	56	≤ 7	≥ 8

4. Visual Inspections. The sample helmets for visual inspections shall be the finished helmets provided to Fort Belvoir as specified in Section L of the RFP. The sample helmets will be visually inspected for defects listed in Table VI at a distance of approximately two (2) feet by the SSEB. The sample helmets shall have no critical defects. Across all samples, there shall be no more than three (3) major defects. Across all samples, there shall be no more than five (5) minor defects.

Table VI. Source Selection Sample Visual Defects

Examination	Defect	Classification		
		Critical	Major	Minor
Helmet shell	Any fabric fibers visibly cut or raised on the shell body (inside or outside).			X
	Any surface dent, depression, or area not smooth.			X
	Any delamination or blister.		X	
	Any evidence of cracking.	X		
	Any evidence of dry spot, any area of nonresin flow or other molding deficiency.		X	
	Any fabric gap, any pit except those specified as (see 3.5.1).		X	
	Any raised pleat or wrinkle, or any raised crease (groove) 1-inch or longer.		X	

Examination	Defect	Classification		
		Critical	Major	Minor
	Any permissible gap or pit not resin filled as specified (see 3.5.1) (exterior only).			X
	Any unauthorized patching, repair or reworking.	X		
	Any evidence of metallic fasteners.	X		
	Any benchmark omitted or obliterated. 1/			X
	Any attaching hole exhibiting delamination or other damage of the shell material.		X	
	Any attaching hole exhibiting fraying (uncut material attached at the edge of the hole).			X
	Air bubbles under suspension system attachment components and hook material.			X
	Suspension system attachment components and hook material incorrect color.			X
	Any suspension system attachment components and hook material omitted.			X
	Any suspension system attachment components or hook disk becoming separated from the helmet shell by removal of a suspension system component or pad.			X
	Suspension system attachment components and hook material firmly attached to the inside surface of helmet with no lifting at any contours			X
	Suspension system attachment material or hook disk coverage inadequate.			X
	Attachment material shape is not uniform			X
	NOTE: Criteria apply to interior and exterior of helmet except as noted. Shell is examined prior to coating.			
Edging	Not completely covering bottom periphery and sides as specified except for the gap at the rear of the helmet if the piece is cut to length.			X
	Any cut, tear, or hole.			X
	Any area not adhered to the shell			X
	NOTE: An area shall be considered not adhered if it can be pulled away from the shell with the thumb or finger.			
	If piece is cut to length - Ends overlapped - Gap between ends in excess of 0.060-inch			 X X
	Butt joint not in rear of helmet			X
	Not correct color			X

Examination	Defect	Classification		
		Critical	Major	Minor
Finish (coating) On exterior, Color on interior	Any cracks, scuffed areas, blemishes such as peeling, blistering or flaking, foreign matter appearing on or embedded in the finish.			X
	Finish wet or tacky to the touch.		X	
	Coating furrows, flakes, or peels when scratched with a fingernail.		X	
	Blemish, such as peeling, blistering, or flaking.		X	
	Is not a smooth, uniform coating (i.e., run or sag affecting an area more than one square inch).			X
	Does not completely and uniformly cover the shell surface and the outside of the edging.			X
	Is not of the specified thickness.		X	
	Foreign matter embedded in or appearing on the finish, such as dirt, stain, oil, or grease.			X
	Color of exterior finish not as specified.		X	
	Interior color of shell not as specified.		X	
	The line between the unpainted surface and the painted surface is not uniform from helmet to helmet with a clean smooth edge without bleed over or other observable workmanship flaws.		X	
	Texturing aggregate overrun extending beyond edge into interior surface of the helmet.			X
	Not uniformly applied to the helmet's outside surface including the outside of the edging.			X
	Hardware exposed on the exterior and interior of the shell.			X
	Evidence of cut blisters.		X	
	Ballistic material showing signs of being visibly cut, gauged, or raised.		X	
	Any unauthorized repair.		X	
Suspension System Assembly	Pads not specified herein, damaged in any way, or not in correct number or shape.	X		
	Any required component omitted		X	
	Any component misplaced or not assembled.		X	
	Easy attachment, removal, and reattachment of the suspension system to the finished shell with no special tools. The suspension system shall remain firmly in place.		X	
	Color of any component not as specified.		X	
	Any hole, cut, tear, or smash.			X

Examination	Defect	Classification		
		Critical	Major	Minor
	Any material not firmly or tightly woven, edges frayed or scalloped.			X
	Any material with multiple floats.			X
	Any material with abrasion mark, broken or missing yarns, slub, or broken end or pick, or multiple floats (if applicable).			X
	Any mend, yarn, or patch.			X
	Any raw edge (note that raw edge not securely caught in stitching shall be classified as open seams).			X
	Any open seam (If the pad has been stitched note that a seam shall be classified as an open seam when one or more stitches joining a seam are broken or when two or more consecutive or runoff stitches occur. If the pad has been RF welded, note that a seam shall be classified as an open seam when the weld is not complete).			X
	Stitch tension loose, resulting in loose bobbin or top thread.			X
	Stitch tension excessively tight, resulting in puckering material.			X
	Stitching ends not secured.			X
	Thread breaks, skipped stitches, or run-offs not overstitched.			X
Marking	Shell: omitted, incorrect, illegible, or not as specified.		X	
	Pads: omitted, incorrect, illegible, or not as specified.		X	
	Retention System: omitted, incorrect, illegible, or not as specified.		X	
	Barcode: omitted, incorrect, illegible, or not as specified.		X	